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NEW UTILITY PATENT APPLICATION TRANSMITTAL

(only for new nonprovisional applications under 37 CFR 1.53(b))

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APPLICATION ELEMENTS

1. ☐ Fee Transmittal Form (in duplicate)
   - ☐ Check Enclosed
2. ☒ Specification
   (preferred arrangement set forth below)
   - ■ Descriptive Title of the Invention
   - ■ Cross Reference(s) to Related Case(s)
   - ■ Statement Regarding Fed sponsored R & D
   - ■ Background of the Invention
   - ■ Brief Summary of the Invention
   - ■ Brief Description of the Drawing(s)
   - ■ Detailed Description
   - ■ Claim or Claims
   - ■ Abstract of the Disclosure
3. ☒ Drawing(s) *(when necessary per 35 USC 113)*
4. Oath or Declaration
   a. ☒ New Declaration
      - ☒ Executed
   b. ☐ Copy from a prior application (37 CFR 1.63(d))
      (for continuation/divisional with Box 17 completed)
      i. ☐ DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
5. ☐ Incorporation by Reference *(useable if Box 4b is checked)*. The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

ACCOMPANYING APPLICATION PARTS

6. ☐ Assignment & Assignment Recordation Cover Sheet
7. ☐ Certified Copy of Priority Document(s)
   (if foreign priority is claimed)
8. ☐ Information Disclosure Statement & PTO-1449
   - ☐ Copies of IDS Citation(s)
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10. Small Entity Statement
    - ☐ New Statement enclosed
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17. **If a CONTINUING APPLICATION,** *check appropriate box and supply the requisite information below and in a preliminary amendment:*
☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: ___/_____

Prior application information: *Examiner:* _____ *Group/Art Unit:* _____

18. CORRESPONDENCE ADDRESS

NAME	Michael R. Blum Fenwick & West LLP				
ADDRESS	Two Palo Alto Square				
CITY	Palo Alto	*STATE*	CA	*ZIP CODE*	94306
COUNTRY	U.S.A.	*TELEPHONE*	(650) 858-7668	*FAX*	(650) 494-1417

Name (Print/Type)	Michael R. Blum	*Registration No. (Attorney/Agent)*	44,543
Signature		*Date*	March 29, 2000

USING THE ELECTRONIC PROGRAM GUIDE TO SYNCHRONIZE INTERACTIVITY WITH BROADCAST PROGRAMS

Inventors:
Brian P. Dougherty
C. Leo Meier

BACKGROUND

Cross-Reference to Related Application

The present application claims priority from U.S. Provisional Patent Application S/N 60/179,825, entitled "Synchronizing the Delivery of Digital Information -- Interactive Applications, Data, and/or Content -- With Broadcast Television Programs and Advertisements", filed on February 2, 2000.

Field of the Invention

The present invention relates generally to the field of interactive television, and more particularly to the automated control of interactivity in synchrony with television broadcast programs.

Background of the Invention

Interactive television attempts to augment broadcast programs with viewer selectable interactivity. This interactivity is typically delivered in the form of interactive content, such as an interactive application, associated with the broadcast program. An interactive application allows the viewer to participate, often in conjunction with events or situations arising in the broadcast program. The interactive content that accompanies a particular broadcast program may be displayed on the television screen simultaneously with the broadcast of the broadcast program, and if so, likely covers a portion of the viewing screen of the broadcast program. For example, a broadcast game show may be accompanied by interactivity that allows the viewer to play along and input answers to

questions being posed during the show. This interactivity is displayed on only a portion of the television screen, so as to allow the viewer to continue to watch the broadcast program.

For interactivity that accompanies a broadcast program, it is desirable to maintain the interactivity in synchrony with the broadcast program. This means that the interactivity should be available to the viewer whenever the broadcast program that it accompanies is being broadcast, and that any state information that the viewer has created, *e.g.* an accumulated point total in a game, should be maintained, even if the broadcast program is temporarily suspended and then resumed, for example, during a commercial break.

It further means that the interactivity should *not* be displayed when the accompanying broadcast program is not being broadcast or is otherwise interrupted. In particular, proper synchrony requires that the interactivity for a television show not be displayed when a commercial is broadcast during the show. This is for two reasons. First, the commercial may have its own interactivity accompanying it, such as a form for the user to request product information about a product advertised during the commercial. Thus, the commercial's interactivity must be displayed, and yet the show's interactivity must be re-displayed when the commercial (or series of commercials) is over and the television show is resumed. Redisplay of the show's interactivity should be prompt and as noted, should preserve the state information that was available when the commercial began. For example, if the viewer was accumulating points in an interactive game, then the accumulated points should be available when the show's interactivity is resumed. This first concept also holds true for interactivity related to just a portion of a show. For example if interactivity is displayed allowing the viewer to order trousers like those worn by the show's host, the viewer's accumulated points should again be available when the interactive trousers promotion disappears.

Second, even if the commercial(s) does not have its own interactivity, it is inappropriate to display the interactivity of the show during the commercial. This is because the interactivity will override a portion of the television screen, thereby covering up part of the commercial, which is unacceptable to the advertiser that paid for the

commercial to be broadcast. Also, the interactivity for the show is not associated with the commercial, and its appearance may confuse the viewer.

It is also desirable to maintain the interactivity in synchrony with particular events on the broadcast program. This means that a particular interactive element should be available to the viewer only when a corresponding broadcast event takes place on the broadcast program. Take the example of the broadcast game show. At the moment that the broadcast program displays the game show host offering a question to an in-studio contestant, it would be desirable for the associated interactive application to display a prompt inviting the viewer to answer the same question. Likewise, as the contestant begins to give his answer aloud, the interactive application would inform the viewer that "time is up" and cease to accept viewer input.

Accordingly, it is desirable to provide an interactive television system, method, and software products that correctly synchronize the interactivity of various broadcast programs as well as events during those programs, and accommodate the interruption of broadcast programs by other broadcast programs.

One approach in the art involves sending the interactive application along with the broadcast program from the national network to the local affiliates. One method specifically is to place a server with the ability to insert an interactive application into the vertical blanking interval (VBI) of a television broadcast at the national network uplink facility. The server integrates with the network playlist system or other program-identifying techniques to insert interactive applications appropriate for the current television program. The program-identifying techniques provide needed timing information for events such as broadcast program starts and stops, commercial break starts and stops, and interruption of either by the start of a second broadcast program. An overview of this early approach is illustrated in Figure 1.

In this early approach, a server module (software application) running on a broadcast server (BS) **110** receives real-time information on the current video program being broadcast from the playlist control system **120**. The playlist control system **120** controls the sequencing of pre-recorded video content (shows and advertisements) shown

here as video sources **130**. This information is used to insert an interactive application, content, or data into the video stream via the data insertion unit (DIU) **140**.

The combined video and interactive application is then delivered (typically via satellite **170** as shown here) to a local network affiliate **160** where the application is either delivered over the air **162** to an interactive enabled settop **150** or over a cable system that re-retransmits the local signal **164** to an interactive enabled settop **150**.

In reality, this configuration sometimes fails to deliver interactive television. One problem is that the interactive application can be lost, destroyed, or knocked out of synch with the television program between insertion of the application into the video stream by the data insertion unit **140**, and reception by an interactive enabled settop **150**. There are technical barriers to delivering interactive content synchronized with television program all along the path from the national network to the local affiliate. Several locations of potential difficulties **199** are illustrated in Fig. 1. and some of the technical barriers are described below.

Multiple Network Feeds – broadcast networks have multiple feeds to provide time shifted delivery of content for each time zone. The equipment used to record and replay video content for different time zones may inadvertently destroy the inserted interactive application by not properly recording the VBI lines that carry it.

Digital Uplinks – some networks digitally compress their signal or convert the signal in some other manner that may not preserve the VBI in which the inserted interactive application is transmitted. Since the digital compression facility is not expecting useful data in the VBI, the interactive application is not compressed and carried over into the digitized system along with the broadcast program, and thus is not available for the user.

Local Affiliate Issues – not only may data placed in the video signal be inadvertently destroyed by equipment at the local affiliate, but well-intended local affiliates can corrupt or destroy the interactive application while time shifting the network feed. Time shifting is achieved by recording the video content from a network feed, but playing it back to the viewing audience at a later time. The video recording equipment can either fail to reload the VBI or improperly record it, thus eliminating the interactive application.

What is needed is a way to deliver the synchronized interactivity along with the broadcast program it was intended to accompany without losing the interactivity portion before the broadcast reaches the user.

A further difficulty is that the resource and bandwidth capabilities of the subnetworks that receive the network broadcast vary significantly. It would be desirable to send customized variations of interactive applications to each subnet. For example, local-into-local service may take the top few broadcast network channels in the country's top 25 markets and rebroadcast those channels as digitally encoded signals so that they can be seen outside of their local markets. Both the receiving hardware and broadcast bandwidth allow a richer application (e.g. with more or better features, options, functions, graphics, or sound) to be delivered to the consumer using this technique. However, existing approaches at best merely pass along an existing interactive application as it was originally broadcast, without taking advantage of the additional subnet bandwidth.

Accordingly, it is desirable to deliver various types and qualities of synchronized interactivity with the various cable (or other broadcasting) systems' broadcasts of the same program based on differing hardware and bandwidth capabilities.

SUMMARY OF THE INVENTION

The present invention provides for automated control of interactivity to maintain synchronous display of the interactivity and its respective broadcast program regardless of signal path corruption and other technical barriers along the broadcast path that may interfere with the conveyance of the interactivity in synchrony with the broadcast program.

In accordance with the present invention, the interactive content need not accompany the broadcast program all the way along the unreliable path that begins at the national networks. Instead, the broadcast program is augmented with the interactive content at a point further along the path toward the viewer. Either a server at the local

network or cable head end, or the viewer's own consumer premise equipment (CPE) can control the identification of the broadcast program, and the coordination of the broadcast program with associated interactive content and other data.

The first step in augmenting a broadcast program with its proper interactive content is to identify the broadcast program. To do so, a device, such as the CPE, references an Electronic Program Guide. Electronic program guides for television systems are known in the art, particularly with regard to cable television systems. They are also known as electronic television program guide schedule systems. The Electronic Program Guide may be broadcast to and stored on a CPE, or be resident on a server on a network such as the Internet and be accessed through a CPE. Conventionally, the EPG is used by viewers to visually determine the correct timing or channel for a particular television show they would like to watch, or to find out generally "what's on TV." The Electronic Program Guide is a database (also called "the EPG database") that provides schedule information for broadcast (including cablecast) programs that may be available for viewing on, for example, a television. The database coordinates geographic location, local time, and channel information with a corresponding broadcast program. A viewer's CPE thus supplies the EPG database with information regarding what channel is being watched, at what time, and in what geographic area (or on what cable or other system), and the EPG database returns data regarding which broadcast program is being watched, such as a program identifier.

In accordance with the invention, the program identifier from the EPG is then coordinated with a list of timing offset objects specific to the broadcast program. In one embodiment, the CPE accomplishes this coordination as follows. Supplying the program identifier retrieved from the EPG as an input, the CPE references a timing offsets database or an interactive content database that correlates the broadcast program identifier with the appropriate timing offsets or the appropriate interactive content. The referenced timing offsets database may be self contained, or it may be a part of the EPG database or a content database. The referenced timing offsets database may be located on the CPE, on a server at the local affiliate, or on a server on another network, such as the Internet. In one embodiment, the timing offsets database returns the timing offsets related to the broadcast program and the CPE later uses them to reference the interactive

content database and retrieve interactive content. In another embodiment, the content database may return an interactive application, an interactive application identifier, or an Internet address (URL) that leads to or controls an interactive application or list of timing offset objects as well as other data. In one embodiment the content database containing the interactive applications and interactive content is located separately from the timing offsets database. Interactive content includes interactive applications, elements of interactive applications, and other interactive content, but for ease of reference, the terms "interactive content" and "interactive application" shall be used interchangeably to cover all forms of interactivity for broadcast programs that are described herein or equivalent to those disclosed.

Timing offsets generally are synchrony-oriented data such as broadcast program start and stop times or other timing data useful to the interactive applications. Start and end times for broadcast programs listed on the EPG are an example of an absolute timing offset. These times help an interactive application server know when to execute and terminate batch interactive applications, or when to execute and terminate individual interactive applications that commence execution at the start of a broadcast program, so that each element of the interactive application associated with the broadcast program will temporally coincide with appropriate triggering events in the broadcast program.

In one embodiment, synchrony between multiple individual interactive applications or events associated with a broadcast program and the broadcast program is maintained using relative timing offsets. In one embodiment, a list of timing offset objects is associated with a broadcast program, each timing offset object containing: a timing offset relative to the start of the program, an application object (such as an interactive application), and an action to take on the application object (such as execute, execute for a duration, suspend, resume, or terminate). Timing offset objects trigger the processor that executes interactive content to initiate time-sensitive elements of the interactive content so that the elements will coincide with events taking place in the broadcast program. For example, the timing offset objects may contain time offsets for the start and end times of each commercial; likewise, if it is desired to synchronize elements in the interactive application (e.g. dialog boxes or voting buttons) with events in the broadcast program (e.g. game show questions), the timing offsets for such events may

also be encoded. For instance, when a game show host is about to reveal the answer, a timing offset triggers termination of the "viewer answer window" interactive application, and the interactive window in which the viewer could have responded is removed from display. As another example, when a commercial break starts in the middle of a broadcast program, the interactive application associated with the broadcast program is triggered by a timing offset to suspend display, yet retain information the viewer will need when the program and the program's interactive application resume.

Timing offset objects may be retrieved on demand or downloaded ahead of time. Timing offset objects may contain simply a list of trigger times, relative to the start of a broadcast program, or as described above, they may contain trigger times in addition to indicators of what elements of the interactive application are to be executed, terminated, run for a duration, suspended, resumed, or triggered.

The primary functions described above as being performed by a viewer's CPE may also be performed by other devices at different locations between the national broadcaster and the CPE. For example, in one embodiment an application server at the local network facility or cable head end uses the EPG to coordinate time, channel and location information with a program identifier. The application server then uses the timing offset database to associate the program identifier with a timing offset object or list of timing offset objects which contains actions to take on interactive content at appropriate times during the broadcast program. The application server may then retrieve the interactive content from an interactive content database and insert it into the broadcast for reception by the viewer's reception equipment which will then display the interactive content. In one embodiment, the content database itself is located at the server at the local network.

These functions may also be divided between the application server and the CPE. For instance, in one embodiment, the application server uses the EPG to coordinate time, channel and location information with a program identifier, and then uses the timing offset database to associate the program identifier with a timing offset object. The application server then inserts the timing offset object, or part thereof, into the broadcast stream for reception by the CPE. The CPE uses data from the received timing offset to reference the interactive content database and retrieve interactive content.

Finally, in any of the above embodiments, the interactive content is displayed (or otherwise provided) in synchrony with the broadcast program. Such display may be accomplished by the CPE. In one embodiment the CPE displays the interactive content after the CPE has itself retrieved the interactive content through the EPG and timing offsets and acted upon it. In another embodiment the CPE displays the interactive content after having received it in the broadcast stream from the local network facility. In another embodiment the CPE displays the interactive content after having received the timing offsets in the broadcast stream, having used them to retrieve the interactive content, and then having acted upon the interactive content. In one embodiment, synchrony is controlled with reference to the local system clock in the CPE, as further described below. In one embodiment, this display of the interactive content overlaps the broadcast program visually; in another the display of the interactive content is on a separate channel or CPE.

The features and advantages described in this summary and the following detailed description are not all-inclusive, and particularly, many additional features and advantages will be apparent to one of ordinary skill in the art in view of the drawings, specification, and claims hereof. Moreover, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe the inventive subject matter, resort to the claims being necessary to determine such inventive subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an illustration of the prior art with locations of potential corruption to the signal highlighted.

Figure 2 is a detailed illustration of the CPE.

Figure 3 is an illustration of the overall system wherein the primary processing is done at the local network affiliate.

Figure 4 is an illustration of the overall system wherein the primary processing is done at the CPE.

Figure 5 is an event trace of the embodiment wherein the primary processing is done at the local network affiliate.

Figure 6 is an event trace of the embodiment wherein the primary processing is done at the CPE.

Figure 7 is a diagram of a timing offset object list.

Figure 8 is an example timeline with timing offsets in a broadcast program.

The figures depict a preferred embodiment of the present invention for purposes of illustration only. One skilled in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the invention described herein.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

I System Architecture

Referring now to Fig. 3, there is shown an illustration of one embodiment of a system in accordance with the present invention. It will be appreciated that the system illustrated in Fig. 3 may be incorporated in to larger, more complex systems while still providing the features and benefits of the invention.

Generally, system **300** includes one or more national broadcasters **310**, means of transmission from national broadcasters to local broadcasters such as satellite **320**, a plurality of local broadcasters typically including local network affiliates **330**, and a transmitter **340/345**. In one embodiment, this transmitter is a conventional cable head end **340**, and in other embodiments the transmitter is a conventional television broadcast transmitter **345** or a high-definition television digital transmitter. Consumer premise devises or equipment (CPEs) **350** are remotely distributed in viewer's homes, offices, and the like. BRs **350** include, but are not limited to, televisions, set top boxes, personal computers, and satellite receivers. The person or persons receiving the programs are referred to a "subscribers" or "viewers." Implementation of the present invention in other installations is certainly feasible.

The system **300** cooperates with multiple national broadcasters **310** and multiple local network affiliates **330**. As used herein, "broadcasting" is transmitting a program to one or more viewers. Transmission of the program takes place on any broadcast signal (including a cablecast or internet multicast signal). A "broadcast" is such a transmission. A "program" or "broadcast program" is a discrete segment of a broadcast. Thus, as defined herein, programs include television shows, commercials, public service announcements, pay-per-view events, and the like. Broadcasters include television networks, both national and local, as well as advertisers who prepare and transmit commercials, pay-per-view providers, cable networks, and the like.

The local network affiliate **330** is a broadcaster and may receive broadcast programs from the national broadcaster **310** and forward those programs to viewers. The local network affiliate **330** may forward such broadcast programs with or without delay

("timeshifting"), with or without the commercials or with different commercials, and with or without the VBI portion as broadcast by the national broadcaster. The local network affiliate **330** may also broadcast other programs not received from the national broadcaster.

The local affiliate **330** may utilize an application server **332**, storage **334**, and a data insertion unit **336**. The application server **332** is preferably a computer system executing one or more software programs providing the functionality described herein. A suitable application server is the Wink Application server, from Wink Communications, Inc. of Alameda, California. In one embodiment, the application server **332** or coupled storage **334** contains one or more EPG databases **360**, the timing offsets database **370**, and/or the interactive content database **380**. In another embodiment these databases are located externally, such as on a remote server on the internet, so that information can be searched for and retrieved from them by the application server **332** by a secure network link or any other transmission media **390** ("remote lookup"). In yet another embodiment, contents of these databases are provided through e-mail or FTP upon request by the application server **332** or in regular or as-required installments.

The EPG database **360** coordinates geographic location, local time, and channel information with a corresponding broadcast programs. The application server **332** either implicitly or explicitly supplies the EPG database **360** with a time and a geographic location (or broadcast source such as a cable or other system), and explicitly with a channel, and the EPG database **360** preferably returns an identifier of which broadcast program is being or will be viewed by viewers at that channel, time, and location. In one embodiment, this identifier is a program ID such as the program identification codes used by broadcast sources. In other embodiments, the EPG database **360** alternatively or additionally returns a list of (or a pointer to a list of) timing offset objects, an interactive application, an interactive application identifier, or an Internet address (URL) that leads to or controls interactive applications and interactive content. In another embodiment, the EPG database **360** returns a list of interactive applications to pre-fetch for later use.

The EPG database **360** may be compiled by any source including the local network affiliate, the national broadcaster in conjunction with its local network affiliates, or a third party such as TV Guide® that collects broadcast scheduling information from

local affiliates and cable broadcasters nationwide. The EPG database **360** may be broadcast to and stored on the application server **332** or in storage **334** coupled to the server **332** for quicker access than a remote lookup could provide.

Referring now to Figures 3 and 7, the timing offsets database **370** preferably contains lists or pointers to lists **770** of timing offset objects, where each list is associated with at least one broadcast program ID **701**. Each list of timing offset objects contains one or more timing offset objects **700**, each timing offset object preferably containing three pieces of data: a timing offset **710**, an application object **720**, and an action **730**. In alternative embodiments, each timing offset object in the list contains only one or two of these pieces of data. For example, in one embodiment, each timing offset object contains just the application object **720**, in which case the list of timing offset objects reduces to a list of application objects where each application object is either interactive content or a reference to interactive content. Such a list of application objects is well suited for pre-fetching interactive applications at a time prior to the running of the application, and then acting upon the pre-fetched applications according to triggers later received in the broadcast signal (or from a remote server or user input) specifying some action at some time. In another embodiment, if the timing offset object includes an action **730** and that action is to execute for a duration, the timing offset contains a fourth piece of data specifying the duration.

In one embodiment, the timing offset **710** is a time, in minutes, seconds, or portions of minutes or seconds. Alternatively, other time bases may be used. In one embodiment, the timing offset **710** is measured from the beginning of a broadcast program. In an alternate embodiment the timing offset **710** is absolute (e.g. 8:06pm). The application object **720** may be an identifier of interactive content or the interactive content itself. Interactive content includes interactive applications, elements of interactive applications, and other interactive content. Identifiers of interactive content include application identifiers, such as UIC identifiers of ICAP applications, described in U.S. Pat. No. 5,689,799, which is entitled "Method and Apparatus for Routing Confidential Information," and is hereby incorporated by reference herein. Identifiers of interactive content also include pointers to network sources of interactive content such as URLs. In one embodiment the application object is a URL and the interactive content is

retrieved from an Internet address such as a Web site corresponding to the URL application object. The name "application object" is not intended to restrict implementation in any way including but not limited to any particular type of data structure or database object. Instead, "application object" as used herein means identifiers of interactive content or interactive content itself as described herein or equivalent to those disclosed, including but not limited to text, graphics, images, URLs, HTML, DHTML, JAVA, XML, and ATVEF. The action **730** is an action to be performed on the application object at the relative time of the timing offset. Actions include but are not limited to starting, stopping, suspending, resuming, triggering, and running for a duration. Examples of triggering include but are not limited to initiating execution of a command script, changing resources, changing forms or other displays in the midst of an interactive application, caching interactive content, and storing usage data. Thus, in the preferred embodiment, a broadcast program is associated through its identifier **701** with at least one list (or at least one pointer to a list **770**) of timing offset objects **700** in the timing offset database **370**. These timing offset objects **700** each instruct a processor to take an action **730** on an application object **720** at a timing offset **710** relative to the start of the broadcast program. The name "timing offset object" is not intended to restrict implementation in any way including but not limited to any particular type data structure or database object. Instead, "timing offset object" as used herein means a collection of timing information (such as a timing offset, an application object, and an action) or references to such information or portions of such information as described herein or equivalent to those disclosed.

Referring now to Figures 7 and 8 and Table 1 (below), in one embodiment, lists of timing offset objects **700** may be of the following types: broadcast program only ("event"), advertising only ("advertising"), or both ("full"). For event timing offset objects, each timing offset **710** refers to an interactive element that will happen during the broadcast program at a time relative to the start of the broadcast program as that program would play without any breaks, such as breaks for commercials.

In the example here, E1 is an event timing offset that takes place 1 minute into the broadcast program. E1 has a timing offset value of 1 minute. Because there are no breaks in the broadcast program before 1 minute, the viewer will experience the

interactive content corresponding to timing offset E1 1 minute after the program starts. E4 is an event timing offset that takes place 12 minutes into the broadcast program. E4 has a timing offset value of 12 minutes. Because there is a 30 second commercial break **822** at 10 minutes into the broadcast program, the viewer will experience the interactive content corresponding to timing offset E4 12 minutes 30 seconds after the start of the program. If the broadcast program were to start at 20:00:00 (8:00 pm), the viewer would experience E4 at 20:12:30. Thus event timing offset objects exist without regards to timing for advertising breaks.

For advertising timing offset objects, each timing offset **710** refers to an interactive element that will happen during a break in the broadcast program at a time relative to the start of the broadcast program. In the example at Table 1 and Fig. 8, A2b is an advertising timing offset that that takes place 20 minutes into the broadcast program. A2b signifies the beginning **807** of the second commercial break **824**. A2b has a timing offset value of 20 minutes. A viewer would experience the interactive content corresponding to timing offset A2b at 20 minutes after the start of the program. A2e signifies the end of the second commercial break and has a value of 20 minutes 30 seconds. If the broadcast program were to start at 20:00:00 (8:00 pm), the viewer would experience the end, triggered by timing offset A2e, of the interactive content corresponding to the commercial **824** at 20:20:30. Advertising timing offsets exist without regards to the specific interactive events that happen during the broadcast program, they refer only to breaks in the broadcast program, and hence pauses in the interactive content associated with the broadcast program.

For full timing offset objects, the list of timing offset objects includes the timing offsets for both the broadcast program and the advertisements. In the example at Table 2 and Fig. 8, F4, F5, and F6 are full timing offsets that take place 10 minutes, 10 minutes 30 seconds, and 12 minutes 30 seconds respectively into the broadcast program, and represent the start of the first commercial (F4), the end of the first commercial (F5), and the fourth element of interactive content in the broadcast program (F6) respectively. The viewer would experience the respective beginnings and endings of interactive content corresponding to F4, F5, and F6 at 10 minutes, 10 minutes 30 seconds, and 12 minutes 30 seconds respectively into the broadcast program. In one embodiment, advertising and

event timing offsets arrive separately and are merged together to produce the equivalent of full timing offsets. In another embodiment all of the timing offsets are full timing offsets. In yet another embodiment, timing offsets can be mixed and of any type.

Table 1

	Relative Timing Offset **710** Min:sec	Time viewer sees it occur relative to start of Broadcast Program (min:sec)	Absolute Timing Offset **710** (hr:min:sec)
E1	1:00	1:00	
E2	5:00	5:00	
E3	7:00	7:00	
E4	12:00	12:30	
E5	20:00	21:30	
E6	21:00	22:30	
A1b	10:00	10:00	20:10:00
A1e	10:30	10:30	20:10:30
A2b	20:00	20:00	20:20:00
A2e	20:30	20:30	20:20:30
A3b	20:30	20:30	20:20:30
A3e	21:00	21:00	20:21:00

b = beginning of break; e = end of break

Table 2

	Relative Timing Offset **710** Min:sec	Time viewer sees it occur relative to start of Broadcast Program (min:sec)	Absolute Timing Offset **710** (hr:min:sec)
F1	1:00	1:00	20:01:00
F2	5:00	5:00	20:05:00
F3	7:00	7:00	20:07:00
F4	10:00	10:00	20:10:00
F5	10:30	10:30	20:10:30
F6	12:30	12:30	20:12:30
F7	20:00	20:00	20:20:00
F8	20:30	20:30	20:20:30
F9	20:30	20:30	20:20:30
F10	21:00	21:00	20:21:00
F11	21:30	21:30	20:21:30
F12	22:30	22:30	20:22:30

In other embodiments, the timing offset database **370** relates timing offset objects or lists of timing offset objects to interactive applications or their identifiers, or URLs or other pointers, which are in turn related to broadcast programs, as opposed to relating the timing offset objects and lists thereof directly to broadcast programs. Timing offsets serve as input to the present invention and may come from any number of different sources such as a producer of a broadcast program, or a broadcaster playlist generated for satellite broadcast with commercials or gaps inserted for commercials. In one embodiment, the timing offsets, the interactive content, and the application server are all provided by one supplier or a coalition of suppliers.

Referring again to Figure 3, the interactive content database **380** stores interactive applications or other forms of interactivity that will be broadcast to various remotely distributed BRs **350**. Interactive applications may be added to the interactive content database **380** by a broadcaster or other program or content supplier and may be transmitted to the database **380** by a secure network link or other transmission media. Each interactive application in the interactive content database **380** preferably has a unique interactive application identification code by which it may be identified. Fields within the interactive content database **380** could also associate interactive applications with, for example, a broadcaster, network, URL, or program.

After determining a broadcast program through the EPG and associating the broadcast program with an interactive application, preferably through a timing offset object, the application server **332** retrieves the associated interactive application from the content database **380**. In another embodiment, after determining a broadcast program, and from it an application object, the application server **332** retrieves, from the content database **380**, a URL instead of the interactive content itself, and then retrieves the interactive content from the Internet or other network at that URL.

In one embodiment of the present invention, the interactive applications stored in the interactive content database **380** are described by a compact communications protocol. The compact protocol is designed to broadcast a compact set of information and commands among the system components in an efficient manner, thereby allowing the use of low bandwidth transports such as the vertical blanking interval ("VBI"). While one embodiment of the present invention uses the compact protocol described herein (see

U.S. Pat. No. 5,689,799), interactive applications may be described by other protocols, including for example, the Hypertext Markup Language ("HTML"), Extended Markup Language ("XML"), SUN MICROSYSTEMS INC.'s JAVA language, or the HTML-based interactive television protocol ATVEF. A detailed description of one compact protocol suitable for interactive applications, including supported definitions, scripts, and commands, is described in U.S. Pat. No. 5,689,799. The interactive applications are themselves software products comprising executable code and data, which configures and controls the operation of a CPE **350** so that the CPE can provide interactivity to the viewer, as further described below.

There may be a plurality of application servers **332**, with each application server **332** serving a particular geographic area, set of broadcasters, or set of subscribers. In one embodiment, each application server **332** is identified by a unique server identification code.

The application server **332** formats a retrieved interactive application, if necessary, and otherwise prepares it for insertion into a broadcast signal. The application server **332** passes the interactive application to a transport (medium) to incorporate the interactive application into the broadcast data **338** concurrent with the broadcast of the program. The invention is transport independent, but examples of possible transports include a concurrent digital MPEG signal, HTTP over TCP/IP, or an analog VBI or radio frequency VBI. In one embodiment, where the transport is a digital broadcast, an MPEG inserter would be used convey the interactive application. In one embodiment, the transport is the analog VBI and a data insertion unit ("DIU") **336** is used to insert commands and data, output by the application server **332**, into the datastream. This datastream is broadcast to the BRs **350** instructing to them, for example, to trigger elements of interactive applications or to start, stop, cancel, suspend, or resume interactive applications currently being received or already resident in memory in the BRs **350**.

Continuing with the example wherein the transport is the analog VBI, the DIU **336** receives the interactive application or commands from the application server **332** and the broadcast signal, or feed, carrying the program corresponding to the interactive application. The broadcast feed may be received from the broadcast program sources, the

broadcaster directly, or, in the case where the broadcaster does not provide the feed, from a third party such as a network, cable operator, or local television station. The application server **332** converts the interactive application and commands into a format suitable for insertion into the broadcaster feed and transmission therewith as broadcast data **338**. The DIU **336** may receive feeds from multiple broadcasters and can insert a separate interactive application into each feed. Likewise, the DIU **336** can simultaneously insert a separate interactive application into multiple channels from the same, or different, broadcasters.

The DIU **336** inserts the broadcast data **338** containing the interactive applications, commands, and broadcast programs into the broadcast medium. In an alternative embodiment, broadcast data contains timing offset objects or elements of timing offset objects (such as application objects) with which the CPE **350** references the interactive content database **380** to retrieve interactive applications. In one embodiment, the DIU **336** uses conventional methods to insert data defining an interactive application into the VBI of the broadcast feed. The North American Broadcast Teletext Standard (EIA-**306**), defines the methods and protocols for sending data in one or more lines of the VBI. However, a wide variety of other transport mechanisms are available, including those that broadcast the interactive application separately from the television program.

In one embodiment, error checking or error correcting codes such as Hamming codes are inserted with the data. In one embodiment, the DIU **336** translates the data into a Hamming code, and in another embodiment, the data received by the DIU **336** from the application server **332** is already encoded.

The DIU **336** is coupled to a transmitter for transmitting the broadcast feed, including any inserted interactive applications or commands from the application server **332**. In one embodiment, the transmitter is a conventional cable system head-end **340** amplifier. In yet other embodiments, the transmitter is a conventional television broadcast transmitter **345** or a high-definition television digital transmitter. Still in other embodiments, the transmitter may transmit the broadcast data over a WAN connection, the Internet, or other public/private networks.

Regardless of transmission method and insertion time, the broadcast data **338**, including the interactive application, is received by a subscriber's CPE **350**. Although

only two BRs **350** are illustrated in Fig. 3, it is understood that in a typical embodiment there are hundreds or thousands of BRs **350** receiving the broadcast data **338** and responding as described herein. In a typical embodiment, the CPE **350** is a television set-top box receiving the data **338** via a coaxial cable. Additionally, the CPE **350** may be integrated into the television. Moreover, other CPEs, including a broadcast receiver such as an NTSC broadcast receiver, a high-definition television digital receiver, a video cassette recorder, or an FM radio receiver can also be used.

It should be noted that the application server **332** may also serve other types of data, separate from or in addition to interactive applications. For example, the application server **332** may serve data such as computer programs or audio/video data. The application server **332** may also provide data, forms, codes, or triggers to interactive applications previously transmitted to the CPEs.

The application server **332** may also serve hypermedia data, such as text, graphics, images, uniform resource locators (URLs), uniform resource identifiers (URIs), HTML, XML, ATVEF, JAVA applets, or other types or formats of data.

In another embodiment, the application server **332**, storage **334**, and data insertion unit **336** are located at the cable head-end **340** as opposed to at the local network affiliate **330**. The functionality and data flow in this embodiment mimics that of the aforementioned local network affiliate embodiment.

Two preferred embodiments are distinguished by locus of control. In the first preferred embodiment, the application server **332** uses the EPG database **360** in conjunction with the timing offsets database **370** to determine which interactive applications should be broadcast on a particular channel in a particular location at a particular time, retrieves the interactive applications corresponding to the particular channel, location, and time or program identification code from the interactive content database **380,** and prepares the interactive applications for broadcast, as described above. In the second preferred embodiment, it is the CPE **350** instead of the application server **332**, that performs these functions; i.e. it is the CPE **350** that performs the EPG **360** lookup and subsequent timing offsets database **370** lookup, as well as the retrieval of the interactive application from the interactive content database **380**. In another embodiment, the EPG **360** lookup and subsequent timing offsets database **370** lookups

are performed by the application server **332**, which feeds the timing offset objects to the data insertion unit **336** to broadcast to the CPE **350** which retrieves the interactive applications from the interactive content database **380 392** and acts upon them. Thus it can be seen that the present invention does not limit the location at which determinations regarding the interactive content are made, or actions regarding the interactive content are taken, or the specific hardware or software apparatus that makes these determinations, or takes these actions.

II Consumer Premise Equipment

Figure 2, and 3 illustrate the consumer premise equipment (CPE) **350** according to an embodiment of the present invention. In one embodiment, the CPE **350** is the Scientific Atlantic Explorer CATV set-top decoder, the Direct TV IRD satellite receiver, or a similar decoding device or broadcast receiver. In other embodiments CPE **350** may be, but is not limited to a television, a personal computer, or a satellite or other receiver. The CPE **350** includes a tuner **202** for receiving the broadcast data **338**. In one embodiment, the tuner **202** is a conventional cable television tuner. In other embodiments, the tuner is a television broadcast tuner, a FM radio tuner, a digital tuner, or some other form of tuner. In yet another embodiment, a personal computer with the appropriate hardware and software may function to display broadcast programs received over various types of transmission channels, including cable, the Internet, and satellite. The embodiment illustrated in Fig. 2 shows a display **218**, typically a television, coupled to the CPE **350**.

The CPE **350** also includes a data extractor **206** (coupled to the tuner **202**) for receiving the EPG, timing offsets, interactive application, or other data from the broadcast data **338** or from other external sources such as a server on a network. This information may be received on demand, as a constant stream, on an as-needed basis, or periodically. In one embodiment, the CPE **350** (using the data extractor **206** and tuner **202**) extracts the interactive content from the inband broadcast data **338** in the VBI and provides it as interactivity to the viewer, while it extracts the EPG database from the out-of-band channel-independent data. In another embodiment, the CPE **350** extracts timing offset objects or elements of timing offset objects from the broadcast data **338** and communicatively couples **392** with the content database **380** via the data extractor **206** to

retrieve and act on the appropriate interactive content and provide it as interactivity to the viewer. In yet another embodiment, the CPE **350** communicatively couples **490** with servers holding the EPG database **360**, the timing offsets database **370**, and the content database **380** via the data extractor **206** to determine, using the microprocessor **210**, a broadcast program, timing offsets for the broadcast program, and interactive content associated with the broadcast program. After retrieving the determined interactive content, the CPE **350** then either acts upon it and provides it as interactivity to the viewer, or caches it until it is needed in conjunction with a broadcast program.

In one embodiment, the data extractor **206** is a conventional VBI inband data extraction circuit. In another embodiment, the data extractor **206** is a conventional modem. In yet another embodiment, the data extractor **206** can function as both of these. The data extractor **206** provides a serial bitstream containing the extracted interactive application onto a bus **208**. The bus **208** is coupled to a microprocessor **210** which stores, via the bus **208**, the extracted program ID, timing offsets, interactive application, or other interactive content into a first storage device **212** as instructed by a program stored in a second storage device **214**. In one embodiment, the microprocessor **210** is coupled to the data extractor via the bus **208** and determines a program ID from the EPG database **360**. In one embodiment, the microprocessor **210** uses the error code information from the extracted data to check or correct errors in the decoded interactive application. In one embodiment, the first storage device **212** is a conventional random access memory ("RAM") while the second storage device **214** is a conventional read-only memory ("ROM"). A third storage device **213**, which may be RAM or flash memory, is coupled to the microprocessor **210** to cache any or all of the full EPG database **360**, the timing offsets database **370**, and the interactive content database **380** if those are not stored externally and referenced through the data extractor **206**. An advantage of flash memory is that software or data resident in the CPE **350** can be modified by a received interactive application. In one embodiment the third storage device **213** is used to store pre-fetched interactive applications.

In one embodiment, the CPE **350** also uses the data extractor **206** to extract a time signal from the broadcast data **338**. The time signal indicates the current time using a standard timebase, such as Coordinated Universal Time ("UTC") or the subscriber's local

time. In another embodiment, the CPE **350** has a real-time clock that is either set by the subscriber or the received time signal. Regardless, the CPE **350** preferably has access to the current time and, accordingly, can execute or control the execution of interactive content in synchrony with broadcast programs and can perform date stamping and timing functions.

The microprocessor **210** uses the program stored in the second storage device **214** and the timing offsets, interactive application, or other interactive content stored in the first storage device **212** to execute the interactive application and provide an output. The program stored in the second storage device **214** is preferably an execution engine **217** for executing and otherwise controlling interactive applications defined by various scripts, forms, definitions, timing offsets, and code and graphic resources. In one embodiment, the execution engine is additionally for retrieving information such as the broadcast program identifier from the EPG database **360**, the timing offsets from the timing offsets database **370**, and the interactive content from the interactive content database **380**. A preferred execution engine is the Wink Engine provided by Wink Communications, Inc. of Alameda, California. The CPE **350** includes either as part of the execution engine **217**, or the native operating system **219** also stored in the second storage device **214**, timer functions that can be run as background processes to countdown from an input value, or equivalent timing specification.

The output from executing an interactive application is interactivity which may be, for example, a form presenting information or a menu to a television viewer or for receiving viewer input, or it may be a response, silent (not apparent to the viewer) or otherwise, containing CPE **350** or television usage data or indicating viewer preferences. For purposes of the present invention, the forms may present any variety of information, and take any variety of user responses. To this end, the CPE **350** preferably includes a graphics overlay generator **216** coupled to the bus **208** and driven by the interactive application, or other interactive content stored in the first storage device **212** and the program stored in the second storage device **214**. The graphics overlay generator **216** generates a graphical display responsive to the interactive application. This graphical display is displayed on a display **218**, typically a television, coupled to the CPE **350**. Of

course, the graphics overlay generator **216** is typically not used when an interactive application silently executes.

In one embodiment, the graphics overlay generator **216** also receives the broadcast signal corresponding to a broadcast program from the tuner **202** to allow simultaneous display of the broadcast program and the graphical aspects, if any, of the interactive application, for example, to input data into a displayed form. In one embodiment, the microprocessor **210** is also coupled to a user input decoder **222** coupled to a user input receiver **224** to allow the user to communicate with the microprocessor **210** in order to respond to the interactive application. In one embodiment, the user input decoder **222** is a conventional infrared remote control decoder. The user input receiver **224** is preferably a conventional infrared receiver **224** with which the user may use a conventional hand-held remote control device.

In one embodiment, the CPE **350** is a cable TV set-top decoder, connected to a cable system via a broadband coax cable. In this embodiment, line driver **230** is an RF modem which is capable of sending responses via the coax cable to the cable system head-end, typically using an out-of-band portion of the RF spectrum, and communications port **232** is a standard RF tap. In another embodiment, the CPE **350** is a television, VCR, or set-top in which line driver **230** is a standard telephone modem and communications port **232** is a standard RJ-11 jack.

III Using the EPG for Synchrony

A. Control by an application server at the local network affiliate or cable head end.

Referring now to Figures 3 and 5, Fig. 5 traces the events involved in one embodiment when an application server at the local network affiliate or cable head end controls use of the EPG to synchronize interactive content with an associated broadcast program. Time progresses in the trace from top to bottom. The horizontal arrows represent actions and information between the sources and actors listed across the top.

Generally, to determine which interactive applications are broadcast at the various times, channels, and so forth, the application server **332** provides the EPG database **360**

with time, channel, and location information as inputs. The EPG database **360** preferably returns a program ID. The application server **332** uses this information to identify and retrieve a corresponding list of timing offset objects from the timing offset database **370**. Timing offset objects reference interactive applications, content, or elements of interactive applications or content (if any) from the content database **380** that is to accompany each broadcast program.

Specifically, the application server **332** determines what interactive content to act upon, how to act upon it, and when. To do so, it first provides **502** the EPG database **360** with a time, a channel, and a location. In one embodiment, the time is the current time. In another embodiment, the time and channel are some future time and any channel that could be watched at that time. The location is information that specifies where the viewer is located. In one embodiment this is a geographic location, such as a 9 digit zip code. In another embodiment it is an identifier of a specific cable or other broadcasting system that does not necessarily cover the same geographic area as a 9 digit zip code. In one embodiment, the location information is not provided explicitly, but is instead implicitly understood, such as when the only application server referencing a particular EPG database is the application server at a particular cable head end, so that the location information remains constant. Using at least the time, channel, and location information provided by the application server **332**, the EPG database **360** returns **504** a program ID referencing the broadcast program being broadcast at the given time, channel, and location.

Next, the application server **332** sends **506** the program ID to a source of timing offset objects lists **370**. Referring briefly also to Figure 7, the source of timing offset objects lists **370**, preferably a database of timing offsets lists, returns **508** a list of timing offset objects **770** or a reference thereto, each timing offset object **700** with a timing offset **710**, an application object **720**, and an action **730**. There may be no pointer to a list of timing offset objects associated with a particular program ID, thus indicating there is no interactive content in the content database **380** for the broadcast program that relates to the program ID returned by the EPG database **360**. If interactive content does exist for this program, then the list of timing offset objects includes one or more timing offset

objects, the list referred to herein as $\{TOO_1 \ldots TOO_x \ldots TOO_n\}$, where TOO_x contains a timing $offset_x$, and application $object_x$, and an $action_x$.

Time t_0 represents the start of the broadcast program. In this embodiment, all timing offsets are given in seconds relative to t_0. Thus, for example, t_1, the timing offset in TOO_1, may be 5.5, meaning that 5.5 seconds after the start of the broadcast program (real time $t_0 + t_1$), the $action_1$ associated with timing offset $object_1$ should be undertaken upon the interactive content identified by application $object_1$. In another embodiment timing offsets are given in other time formats. In another embodiment they are given relative to the most recent timing offset. In yet another embodiment they are given in absolute time, such as 7:00:05.5 pm.

To extract interactive content from the content database, identifying information from the application $object_1$ is provided **512** to the content database **380** by the application server **332** as input. This application $object_1$ is associated at the interactive content database **380** with interactive content to be acted upon in a manner dictated by $action_1$ at timing $offset_1$ (i.e. relative time t_1 which equals real time $t_0 + t_1$). The interactive content database **380** then returns **514** the interactive content identified by the given application $object_1$. In another embodiment, the interactive content database **380** returns an internet URL or other pointer to network sources for interactive content and the application server **332** references that source to retrieve the interactive content on which to act. In another embodiment, the interactive content may already be included in the application object in which case there is no need to retrieve it from the content database.

The application server **332** then manipulates the retrieved interactive content according to $action_1$ and inserts **516** it into the broadcast stream via the DIU **336**. In one embodiment this manipulation involves one or more of: passing the data straight through the DIU into the broadcast stream repeatedly for the duration of the interactive application's runtime; sending a command to suspend, resume, start, terminate, trigger, or run for a duration; and modifying the data to prepare it to be displayed or otherwise acted upon by a CPE **350**. In one embodiment the inserted interactive $content_1$ sent from the application server **332** to the CPE **350** is described by definitions, scripts, and commands, which may be encoded and broadcast in any order. In one embodiment the application

server performs the functions of retrieving the interactive content, manipulating it, and transporting it to the DIU using three corresponding software modules.

The CPE **350** listens for and receives the interactive content in time to act **518** upon it at time = timing offset$_1$ = t_0+t_1. Acting upon the interactive content here means manipulating the behavior or display of interactive content, or otherwise providing the viewer with interactivity in accordance with definitions, scripts, and commands sent by the application server **332**. In one embodiment acting upon the interactive content takes one of four forms: following commands such as determining whether or not to make an application active, suspend it, or kill it; retrieving interactivity from an external server at a URL; silently running or visibly displaying forms of interactivity on the screen; and accepting and managing user input.

Steps **512**, **514**, **516**, and **518** are then repeated for each timing offset object in {TOO_2... TOO_x...TOO_n}.

In another embodiment, all of the interactive content$_{1...x...n}$ is determined **512** and retrieved **514** before any of it is inserted. It is then inserted **516** as appropriate to be acted upon **518** at the appropriate times by the CPE **350**.

In various embodiments, the EPG database **360**, the timing offsets database **370**, and the content database **380** may be located logically or physically together or separate and they may be located at or distributed amongst any of the local network affiliate **330**, the cable head-end **340**, the application server **332**, the CPE **350**, or a local or external source communicatively coupled to any of the above **390**, **392**. In another embodiment, the timing offset objects are dynamically provided through email, from a server on the Internet, or through network or modem connections to a remote server. In yet another embodiment, the timing offset objects are provided from the national broadcaster as identifiers embedded in the video or close captioned portion of the VBI.

B. Control by the Consumer Premise Equipment.

Referring now to Figures 4 and 6, Fig. 6 traces the events involved when the consumer premise equipment (CPE) controls use of the EPG to synchronize interactive

content with an associated broadcast program. In summary, the event trace is similar to the trace described in section III A., above, with the exception of two primary differences. First, those actions described as taken by the application server **332** are instead taken by the CPE **350**. Second, the interactive application does not need to be sent from an application server to the CPE because the CPE **350** itself references **602** the EPG database **360** using the time, channel, and location to retrieve **604** a program ID, references **606** the source of the timing offsets lists **370** using the program ID to retrieve **608** a list of timing offset objects, and references **612** the interactive content database **380** using the application object to retrieve **614** the interactive application on which to take action at timing offset. Thus, the interactive content need not be inserted into the broadcast stream and sent to the CPE **350** since it is already there. The CPE itself **350** then manipulates the retrieved interactive content according to the action specified in the timing offset object and formulates interactive content to provide to it the viewer as interactivity by the timing offset.

Specifically, the CPE **350** determines what interactive content to act upon, how to act upon it, and when. To do so, it first provides **602** the EPG database **360** with a time, a channel, and a location. In one embodiment, the time and channel are the current time and a current channel being watched by a viewer. In another embodiment, the time and channel are some future time and any channel that could be watched at that time. As before, the location is information that specifies where the viewer is located. In one embodiment, the location need not be explicitly provided, but may be implicit, for example if the viewer's own CPE were always at a constant location and were to reference a locally cached EPG, the location element would remain constant with every reference and would not need to be explicitly considered. Using at least the time, channel, and location information provided by the CPE **350**, the EPG database **360** returns **604** a program ID referencing the broadcast program being broadcast at the given time, channel, and location.

Next, the CPE **350** sends **606** the program ID to a source of timing offset objects lists **370**. Referring briefly also to Figure 7, the source of timing offset objects lists **370** returns **608** a list of timing offset objects **770**. As before, there may be no list of timing offset objects associated with a particular program ID, thus indicating there is no

interactive content in the content database **380** for the broadcast program that relates to the program ID returned by the EPG database **360**. If interactive content does exist for this program, then the list of timing offset objects includes one or more timing offset objects.

To extract interactive content from the content database, identifying information from the application $object_1$ is provided **512** to the content database **380** by the CPE **350** as input. This application $object_1$ is associated at the interactive content database **380** with interactive content to be acted upon in a manner dictated by $action_1$ at timing $offset_1$ (i.e. relative time t_1 which equals real time $t_0 + t_1$). The interactive content database **380** then returns **614** the interactive content identified by the given application $object_1$. In another embodiment, the interactive content database **380** returns an internet URL or other pointer to network sources for interactive content and the CPE **350** references that source to retrieve the interactive content on which to act.

The CPE **350** then manipulates the retrieved interactive content according to $action_1$ and acts **618** upon it at time = timing $offset_1 = t_0+t_1$. In one embodiment this manipulation involves either or both of: determining to suspend, resume, start, terminate, trigger the interactive content or an element thereof, or to run it for a duration; and modifying the data to prepare it to be displayed or otherwise acted upon to provide the viewer with interactivity. In one embodiment the CPE performs the functions of retrieving the interactive content and manipulating it using two corresponding software modules. In another embodiment, all of the interactive $content_{1...x...n}$ is determined **612**, retrieved **614** (pre-fetched), and stored (pre-cached) before any of it is acted upon **618** at the appropriate times by the CPE **350**. In one embodiment the CPE **350** receives triggers from the national or local broadcaster or the local cable affiliate at the appropriate times, triggering the CPE to manipulate, display, or otherwise act upon **618** the pre-fetched, pre-cached interactive content.

Steps **612**, **614**, and **618** are then repeated for each timing offset object in $\{TOO_2 \ldots TOO_x \ldots TOO_n\}$.

In various embodiments, the EPG database **360**, the timing offsets database **370**, and the content database **380** may be located logically or physically together or separate and they may be located at or distributed amongst any of the local network affiliate **330**,

the cable head-end **340**, the CPE **350**, or a local or external source communicatively coupled to any of the above **490**. In another embodiment, the timing offset objects are dynamically provided through email, from a server on the Internet, or through network or modem connections to a remote server. In yet another embodiment, the timing offset objects are provided from the national broadcaster as identifiers embedded in the video or close captioned portion of the VBI.

As will be understood by those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. For example, databases such as the EPG, the timing offsets database, and the content database may be found locally or stored externally in fragments, in whole, or in combination with each other or other unrelated information. Also, various computers in any number of locations along the path from the national broadcaster to the CPE may take actions upon the interactive content. The actions that can be taken include those specified herein, but also include any number of other possibilities. Accordingly, the disclosure of the present invention is intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the following claims.

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What is claimed is:

1. A computer implemented method of controlling the reception of an interactive application, comprising:

determining, using an electronic program guide, a timing offset object associated with a broadcast program, the timing offset object comprising:

a timing offset relative to the start of the broadcast program,

an interactive application object, and

an action to take with regards to the interactive application; and

performing the action on the interactive application object at the timing offset to maintain synchrony of the interactive application with the display of the broadcast program.

2. The computer implemented method of claim 1 wherein determining, using an electronic program guide, a timing offset object associated with a broadcast program comprises:

providing

timing information of a broadcast program, and

channel information of the broadcast program,

as inputs to an electronic program guide, to determine the broadcast program; and

determining a timing offset object associated with the determined broadcast program.

3. The computer implemented method of claim 1 wherein determining, using an electronic program guide, a timing offset object associated with a broadcast program comprises:

providing

timing information of a broadcast program,

channel information of the broadcast program, and

location information of the broadcaster of the broadcast program

as inputs to an electronic program guide, to determine the broadcast program; and

determining a timing offset object associated with the determined broadcast program.

4. The computer implemented method of claim 1 wherein the action to take is one of starting, running for a duration, stopping, suspending, resuming, or triggering the interactive application or an element of the interactive application.

5. The computer implemented method of claim 1 wherein the interactive application object is one of interactive content, interactive applications, or elements of interactive applications.

6. The computer implemented method of claim 1 wherein the interactive application object is one of identifiers of interactive content, identifiers of interactive applications, identifiers of elements of interactive applications, interactive content, interactive applications, or elements of interactive applications, and wherein performing the action on the interactive application object comprises:

determining from an identifier the interactive application object it identifies; and

performing the action on the identified interactive application object.

7. The interactive application object of claim 6 wherein the identifier is a pointer to a network source for interactive content.

8. The interactive application object of claim 6 wherein the identifier is a uniform resource locator (URL).

9. The computer implemented method of claim 1 wherein the interactive application object is a URL and performing the action on the interactive application object further comprises:

retrieving interactive content from a server on the Internet referenced by the URL; and

performing the action on the retrieved interactive content.

10. A system for referencing an electronic program guide to facilitate the control of the reception of an interactive application, the system comprising:

an application server for

determining, from the electronic program guide, a broadcast program based on time and channel information,

determining, based on the determined broadcast program, actions to take to retrieve and provide interactive content coordinated with the broadcast program, and

delivering the interactive content in accordance with the determined actions; and

a consumer premise equipment communicatively coupled to the application server for receiving and displaying the interactive content.

11. A system for referencing an electronic program guide to facilitate the control of the reception of an interactive application, the system comprising:

a consumer premise equipment for

determining, from the electronic program guide, a broadcast program based on time and channel information,

determining, based on the determined broadcast program, actions to take to retrieve and provide interactive content coordinated with the broadcast program, and

displaying the interactive content in accordance with the determined actions.

12. A system for facilitating the control of the reception of an interactive application, the system comprising:

an electronic program guide database for receiving time, channel, and location information as inputs and outputting an identifier of a broadcasts program;

a timing offsets database for receiving the identifier of the broadcast program output by the electronic program guide as input, and outputting

an identifier of interactive content,

an action to take on the identified interactive content,

a time at which to take the action; and

an interactive content database for receiving the identifier of interactive content output by the timing offsets database as input, and outputting interactive content associated with the broadcast program being displayed at the time and on the channel.

13. The system of claim 12 wherein the output interactive content is a URL identifying a location on a server on the Internet from which the interactive content can be retrieved.

14. A computer implemented method of controlling the broadcast and reception of an interactive application, comprising:

determining, using an electronic program guide, an interactive application associated with a broadcast program; and

controlling the interactive application to maintain synchrony with the display of the broadcast program.

15. The computer implemented method of claim 14 further comprising:

determining timing offsets associated with the broadcast program; and where

controlling the interactive application to maintain synchrony with the display of the broadcast program is done in accordance with the timing offsets.

16. The method of claim 15 wherein determining, using an electronic program guide, an interactive application associated with a broadcast program comprises:

determining from an electronic program guide, a program identifier; and

determining from the program identifier, an interactive application associated with the broadcast program.

17. The method of claim 15 wherein determining, using an electronic program guide, an interactive application associated with a broadcast program comprises:

determining from an electronic program guide, a program identifier;

determining from the program identifier, a uniform resource locator (URL); and

determining from the URL, an interactive application associated with the broadcast program.

18. The method of claim 15 wherein determining, using an electronic program guide, an interactive application associated with a broadcast program comprises:

determining from an electronic program guide, a program identifier;

determining from the program identifier, a URL;

determining from the URL, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, an interactive application associated with the broadcast program.

19. The method of claim 15 wherein determining, using an electronic program guide, an interactive application associated with a broadcast program comprises:

determining from an electronic program guide, a program identifier;

determining from the program identifier, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, an interactive application associated with the broadcast program.

20. The method of claim 15 wherein determining, using an electronic program guide, an interactive application associated with a broadcast program comprises:

determining from an electronic program guide, a URL; and

determining from the URL, an interactive application associated with the broadcast program.

21. The method of claim 15 wherein determining, using an electronic program guide, an interactive application associated with a broadcast program comprises:

determining from an electronic program guide, a URL;

determining from the URL, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, an interactive application associated with the broadcast program.

22. The method of claim 15 wherein determining, using an electronic program guide, an interactive application associated with a broadcast program comprises:

determining from an electronic program guide, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, an interactive application associated with the broadcast program.

23. The method of claim 15 wherein determining timing offsets associated with the broadcast program comprises:

receiving timing offsets associated with the broadcast program from an external source.

24. The method of claim 23 wherein the external source is a remote server, and receiving the timing offsets comprises:

accessing the remote server via a network connection; and

downloading the timing offsets.

25. The method of claim 23 wherein the external source is a remote server, and receiving the timing offsets comprises:

receiving an email containing the timing offsets via network connection from the remote server.

26. The method of claim 23 wherein the external source is a national broadcaster that embeds the timing offsets in the vertical blanking interval of the broadcast program.

27. The method of claim 15 wherein determining timing offsets associated with the broadcast program comprises:

determining from the interactive application, timing offsets associated with the broadcast program.

28. The method of claim 15 wherein determining timing offsets associated with the broadcast program comprises:

determining from an electronic program guide, a program identifier; and

determining from the program identifier, timing offsets associated with the broadcast program.

29. The method of claim 15 wherein determining timing offsets associated with a broadcast program comprises:

determining from an electronic program guide, a program identifier;

determining from the program identifier, a URL; and

determining from the URL, timing offsets associated with the broadcast program.

30. The method of claim 15 wherein determining timing offsets associated with a broadcast program comprises:

determining from an electronic program guide, a program identifier;

determining from the program identifier, a URL;

determining from the URL, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, timing offsets associated with the broadcast program.

31. The method of claim 15 wherein determining timing offsets associated with a broadcast program comprises:

determining from an electronic program guide, a program identifier;

determining from the program identifier, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, timing offsets associated with the broadcast program.

32. The method of claim 15 wherein determining timing offsets associated with a broadcast program comprises:

determining from an electronic program guide, a URL; and

determining from the URL, timing offsets associated with the broadcast program.

33. The method of claim 15 wherein determining timing offsets associated with a broadcast program comprises:

determining from an electronic program guide, a URL;

determining from the URL, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, timing offsets associated with the broadcast program.

34. The method of claim 15 wherein determining timing offsets associated with a broadcast program comprises:

determining from an electronic program guide, an identifier of an interactive application associated with the program; and

determining from the identifier of the interactive application, timing offsets associated with the broadcast program.

35. The method of claim 15, wherein the broadcast program is a television show, and wherein controlling the interactive application further comprises:

responsive to determining from the timing offsets that an element of the interactive application is to be executed at a time relative to the beginning of the television show, generating a command to execute the element of the interactive application at the given time.

36. The method of claim 15 wherein the broadcast program is a television show, and wherein controlling the interactive application further comprises:

responsive to determining from the timing offsets that there is a break in the television show, generating a command to suspend execution of the interactive application associated with the television show; and

responsive to determining from the timing offsets that the break in the television show has ended, generating a command to resume execution of the interactive application associated with the television program.

37. The method of claim 15, wherein the broadcast program is a first television show, and wherein controlling the interactive application further comprises:

responsive to determining from the timing offsets that there is a break in the first television show, generating a command to suspend execution of a first interactive application associated with the first television show;

responsive to determining from the timing offsets that the first television show is being broadcast after the break has ended, generating a command to restart execution of the first interactive application; and

responsive to determining from the timing offsets that a second television show is being broadcast, generating commands to terminate the first interactive application and to begin execution of a second interactive application associated with the second television show.

38. The method of any of claims 36-37, wherein the break is due to a commercial being broadcast.

39. The method of claim 15 wherein determining an interactive application using an electronic program guide comprises:

determining timing information of the broadcast program;

determining channel information of the broadcast program;

determining location information of the broadcaster of the broadcast program; and

determining, using the timing, channel, and location information as inputs to an electronic program guide, an interactive application.

40. The method of claim 15, wherein controlling the interactive application comprises:

executing, from an interactive application server, commands from the timing offsets for selectively instructing a server to trigger events within interactive applications and to schedule, start, stop, and cancel interactive applications for the broadcast program associated with the timing offsets at corresponding times determined by the timing offsets.

41. The method of claim 15, wherein the electronic program guide resides at least primarily on a viewer's own consumer premise equipment.

42. The method of claim 15, wherein the electronic program guide resides primarily on a server remote from a viewer's own consumer premise equipment.

43. The method of claim 15, wherein the interactive application is run at least primarily on a viewer's own consumer premise equipment.

44. The method of claim 15, wherein the interactive application is run primarily on a server remote from a viewer's own consumer premise equipment.

45. A computer implemented method of controlling the reception of at least one interactive application, comprising:

determining, using an electronic program guide, a list of interactive applications associated with a broadcast program;

pre-fetching the listed interactive applications;

storing the pre-fetched interactive applications;

receiving a trigger for one of the fetched applications; and

inserting one of the interactive applications into the broadcast stream in response to the trigger.

46. A computer implemented method of controlling the reception of at least one interactive application, comprising:

determining at a consumer premise equipment (CPE), using an electronic program guide, a list of interactive applications associated with a broadcast program;

pre-fetching the listed interactive applications;

storing the pre-fetched interactive applications in a storage device coupled to the CPE;

receiving, at the CPE, a trigger for one of the fetched applications; and

displaying, at the CPE, one of the interactive applications in response to the trigger.

47. The computer implemented method of either claim 45 or claim 46 wherein the trigger is received in the broadcast stream.

USING THE ELECTRONIC PRFFGRAM GUIDE TO SYNCHRONIZE INTERACTIVITY WITH BROADCAST PROGRAMS

ABSTRACT OF THE DISCLOSURE

In a broadcasting system, an electronic program guide (EPG) is used to determine what broadcast program is on a given channel at a given time in a given location. With the particular determined broadcast program as an input, timing offset objects defining interactive content related to the determined broadcast program can be retrieved from a timing offsets database. Each timing offset object specifies a time from the beginning of the program, an act to perform at the time, and a reference to interactive content on which to perform the act at the time. With the reference to the interactive content as an input, an interactive application or other interactive content can be retrieved from an interactive content database. The EPG, the timing offsets database, and the interactive content database may be located logically or physically together or separately, and they may be cached locally or referenced from an external source. If the above determinations have been made upstream from the consumer premise equipment (CPE), the act is performed on the interactive content and the resulting interactivity is inserted into the broadcast stream to be received by a CPE. If the above determinations have been made by the CPE itself, the act is performed on the interactive content and there is no need to insert the resulting interactivity into the broadcast stream as the CPE already possesses its instructions. Finally, at the time of the timing offset, the CPE uses the interactive content to provide interactivity to the viewer.

Docket # 19502/04562

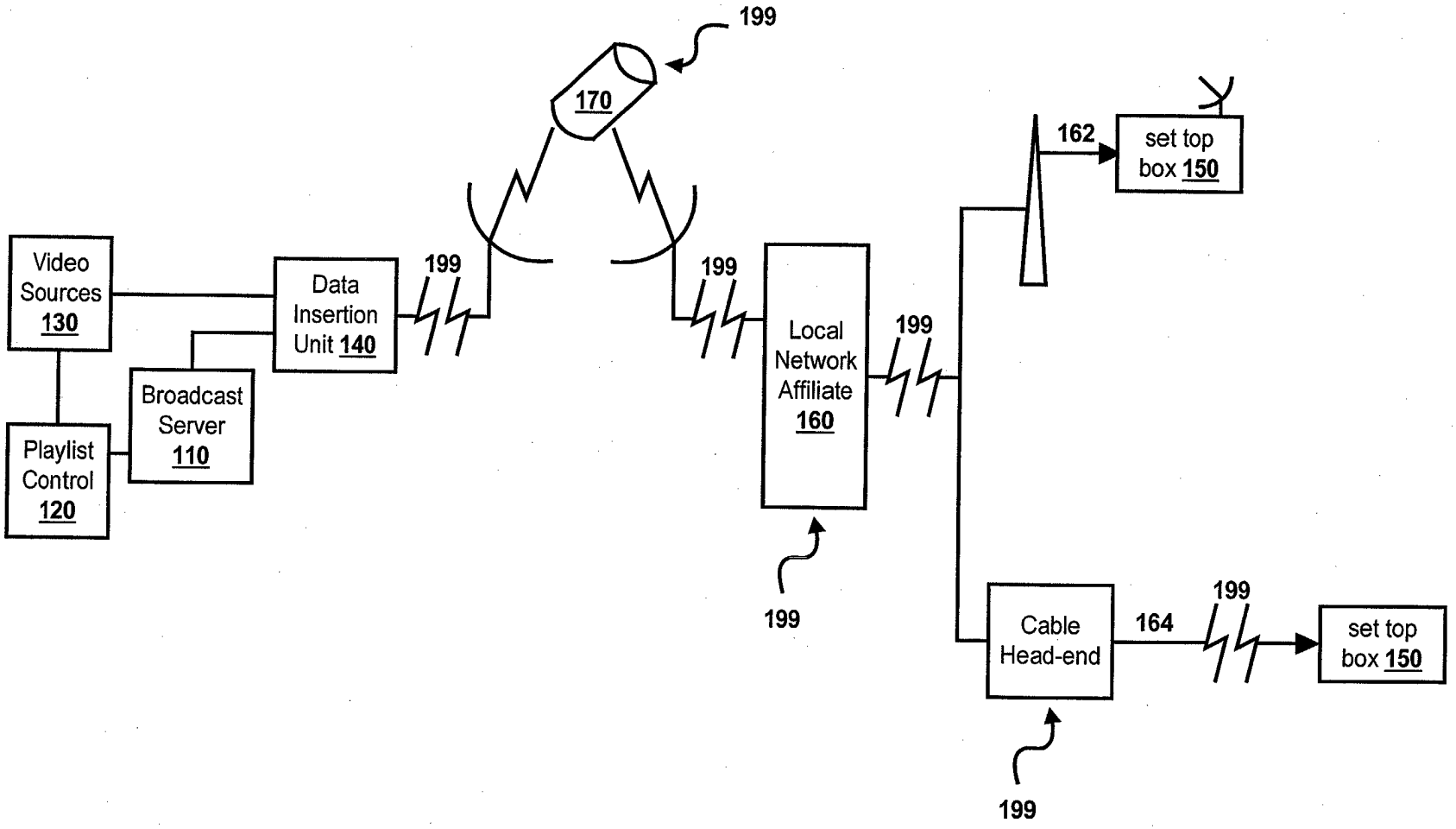

Figure 1 (Prior Art): Locations of potential corruption or loss of signal carrying Interactive Application

Figure 2

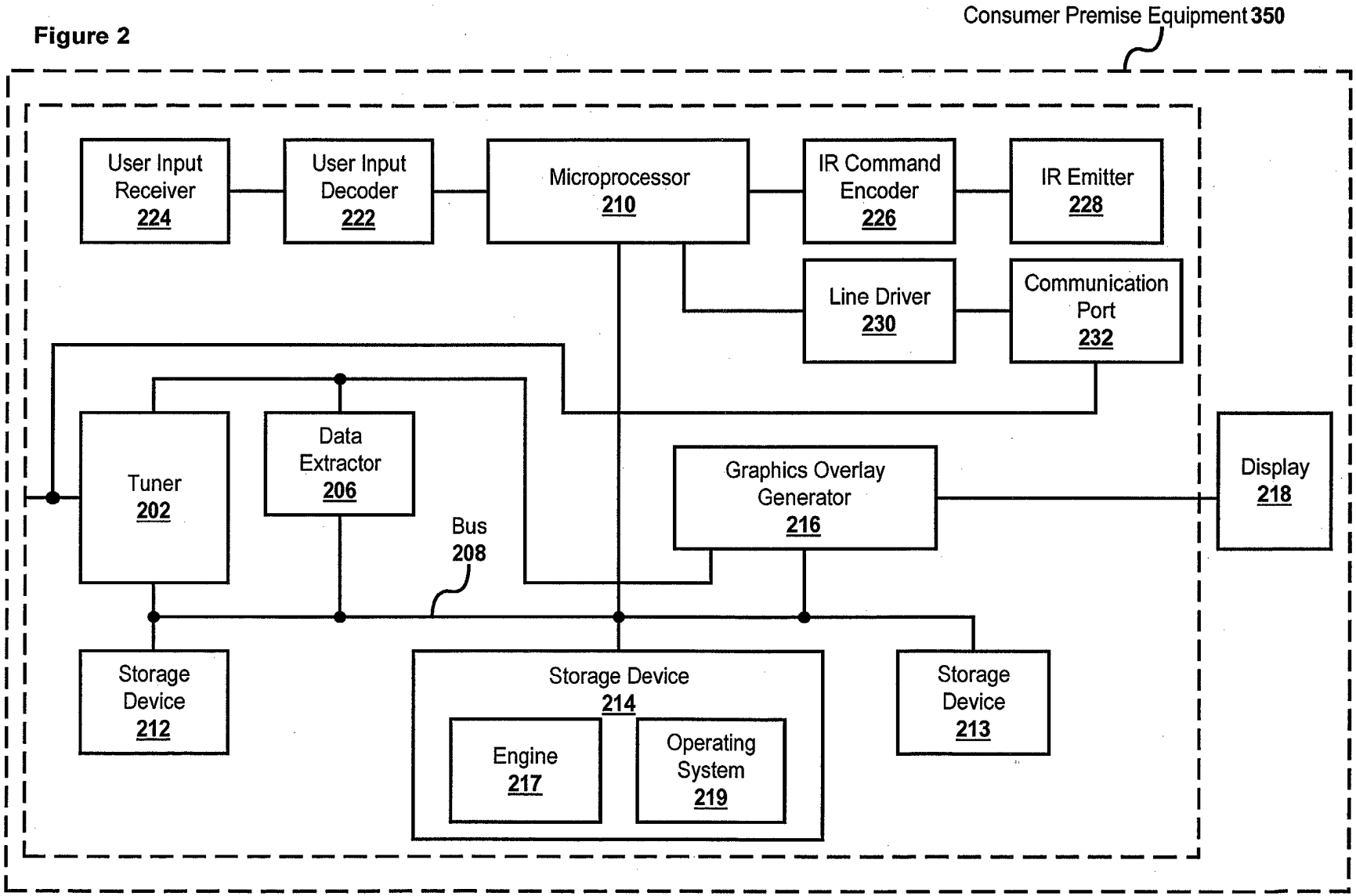
Consumer Premise Equipment 350
User Input Receiver 224
User Input Decoder 222
Microprocessor 210
IR Command Encoder 226
IR Emitter 228
Line Driver 230
Communication Port 232
Tuner 202
Data Extractor 206
Bus 208
Graphics Overlay Generator 216
Display 218
Storage Device 212
Storage Device 214
Engine 217
Operating System 219
Storage Device 213

Figure 3

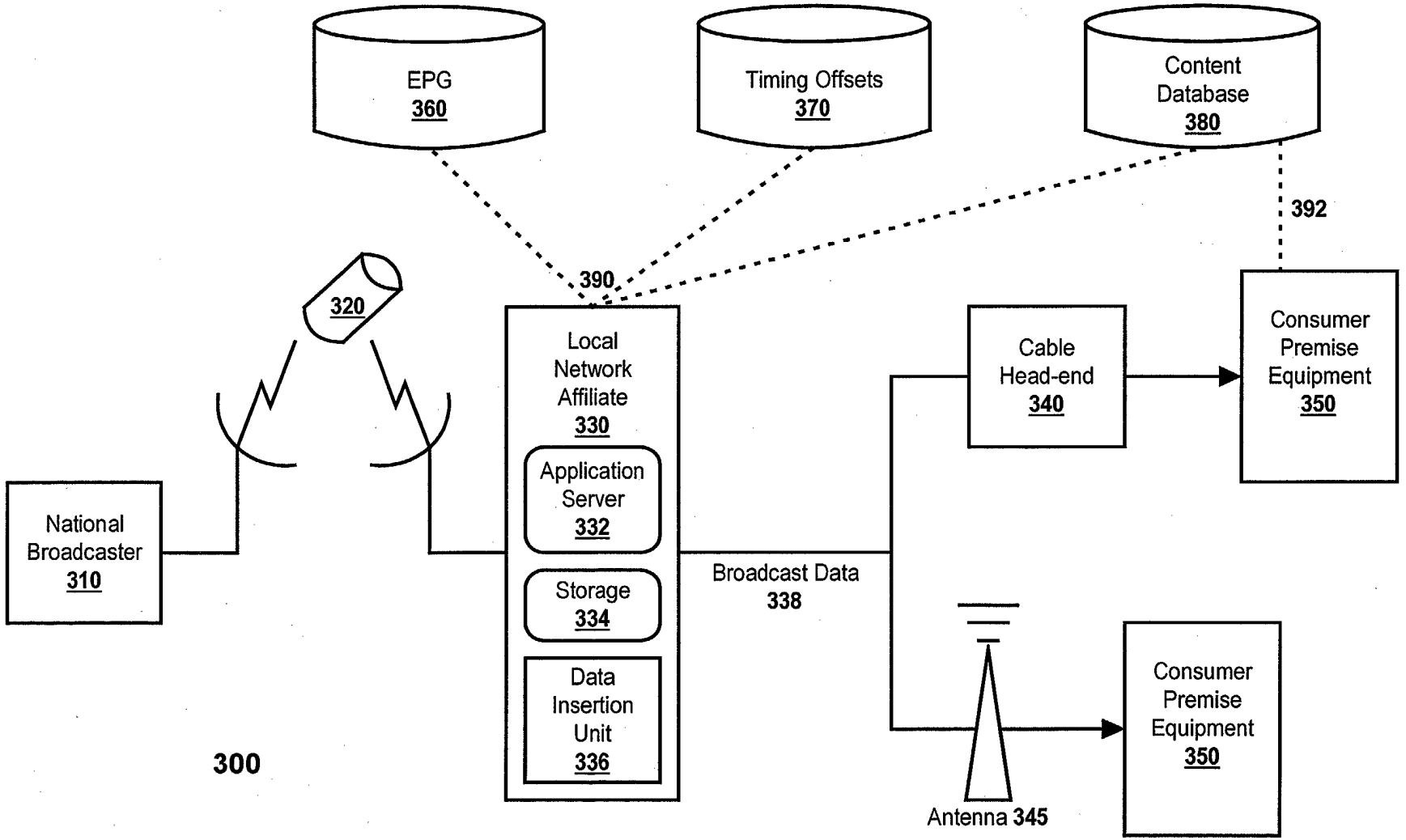
EPG
360
Timing Offsets
370
Content
Database
380
392
390
320
Local
Network
Affiliate
330
Application
Server
332
Storage
334
Data
Insertion
Unit
336
National
Broadcaster
310
Broadcast Data
338
Cable
Head-end
340
Consumer
Premise
Equipment
350
Consumer
Premise
Equipment
350
Antenna 345
300

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Figure 4

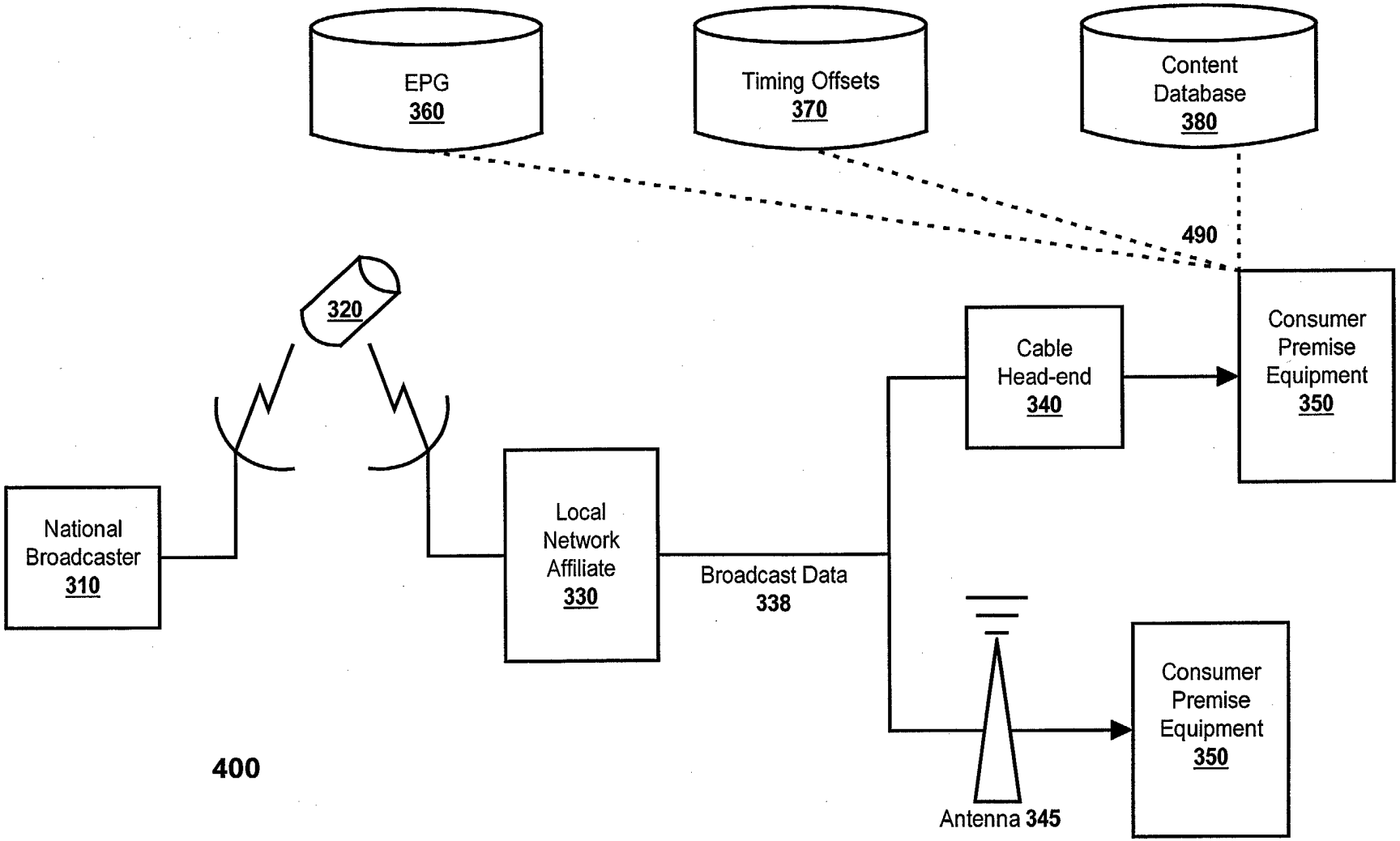

Figure 5

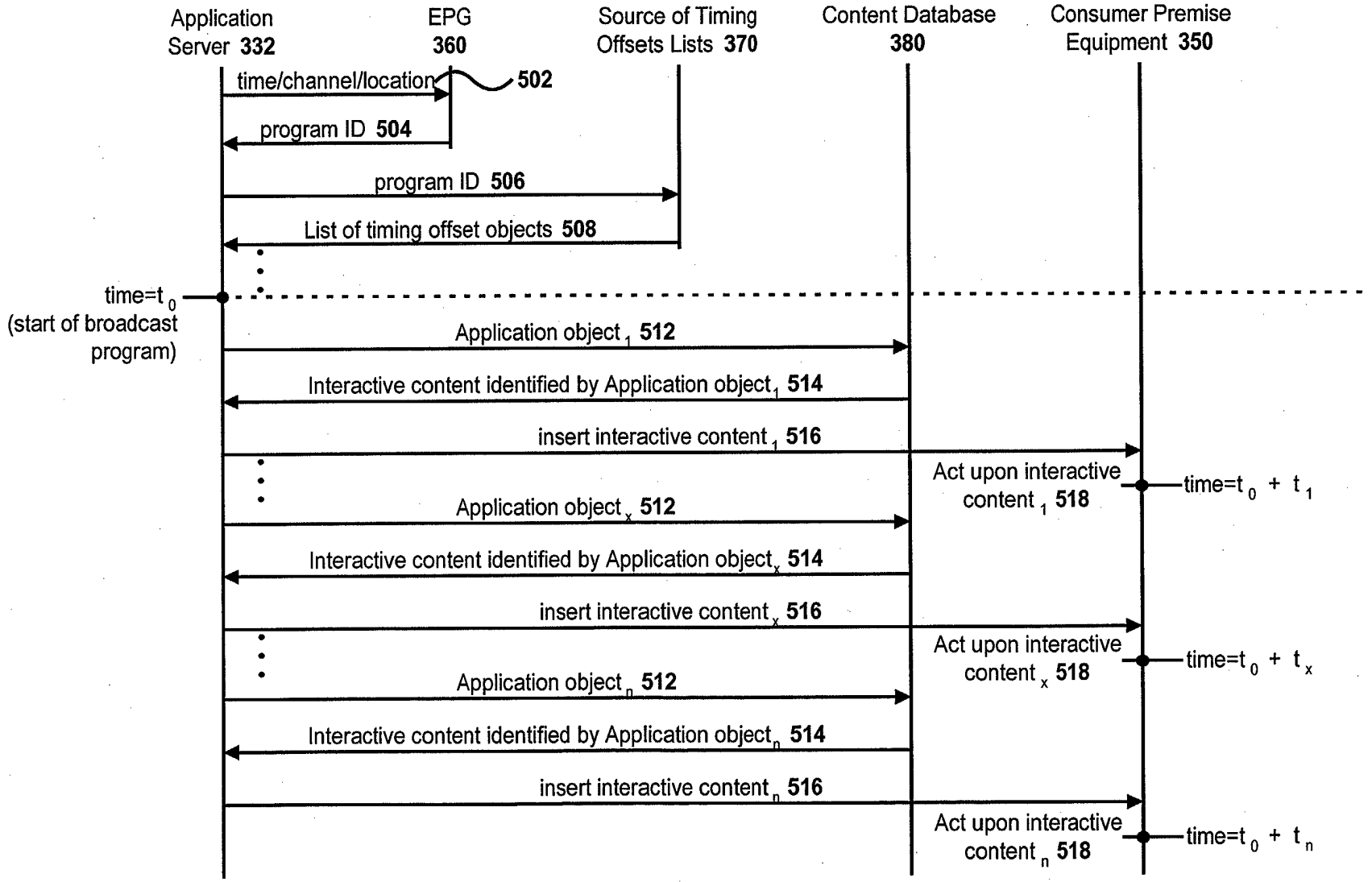
Application Server 332
EPG 360
Source of Timing Offsets Lists 370
Content Database 380
Consumer Premise Equipment 350
time/channel/location
502
program ID 504
program ID 506
List of timing offset objects 508
time=t 0
(start of broadcast program)
Application object 1 512
Interactive content identified by Application object 1 514
insert interactive content 1 516
Act upon interactive content 1 518
time=t 0 + t 1
Application object x 512
Interactive content identified by Application object x 514
insert interactive content x 516
Act upon interactive content x 518
time=t 0 + t x
Application object n 512
Interactive content identified by Application object n 514
insert interactive content n 516
Act upon interactive content n 518
time=t 0 + t n

Figure 6

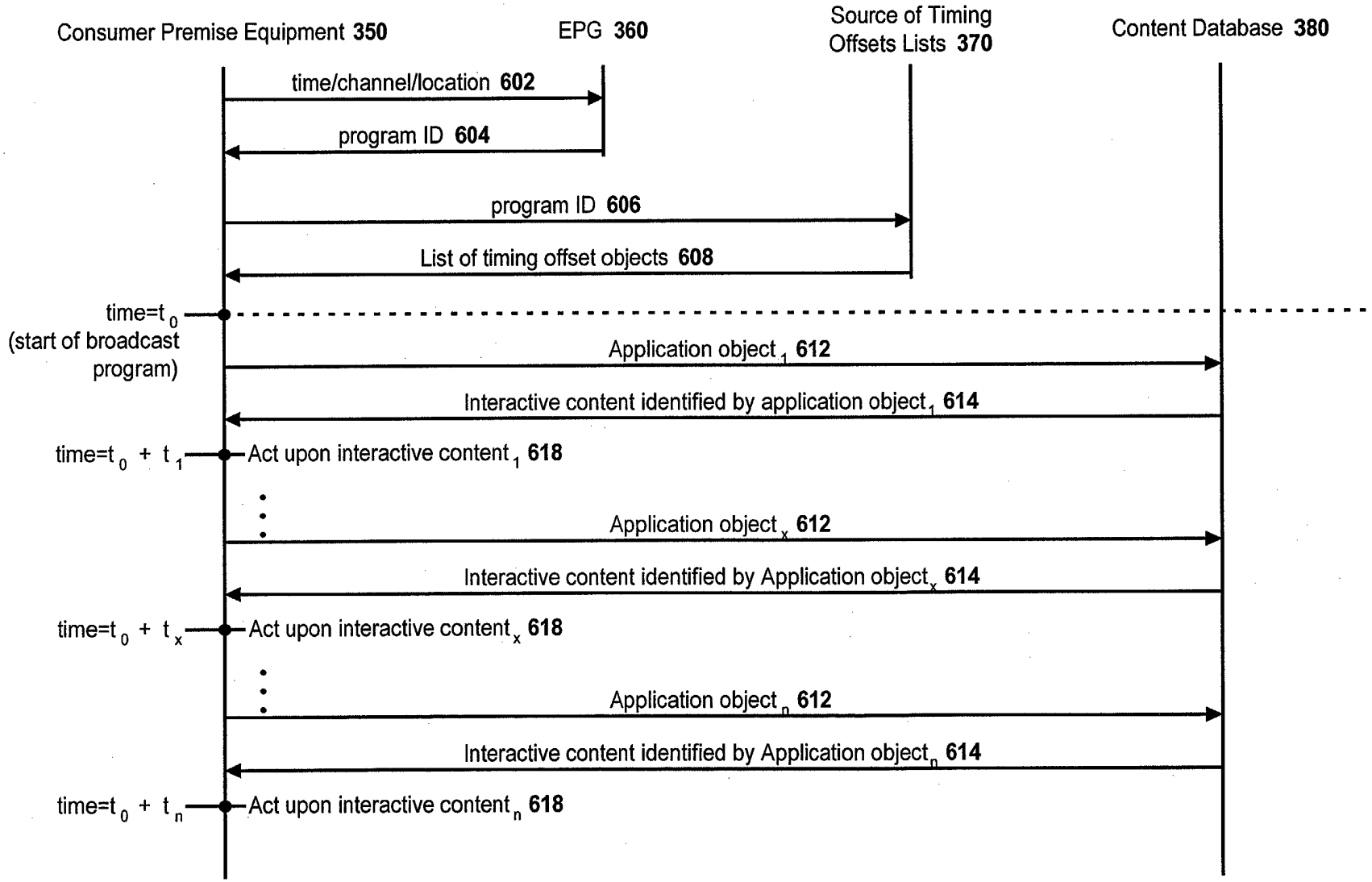
Consumer Premise Equipment 350
EPG 360
Source of Timing Offsets Lists 370
Content Database 380
time/channel/location 602
program ID 604
program ID 606
List of timing offset objects 608
time=t0 (start of broadcast program)
Application object1 612
Interactive content identified by application object1 614
time=t0 + t1
Act upon interactive content1 618
Application objectx 612
Interactive content identified by Application objectx 614
time=t0 + tx
Act upon interactive contentx 618
Application objectn 612
Interactive content identified by Application objectn 614
time=t0 + tn
Act upon interactive contentn 618

Figure 7

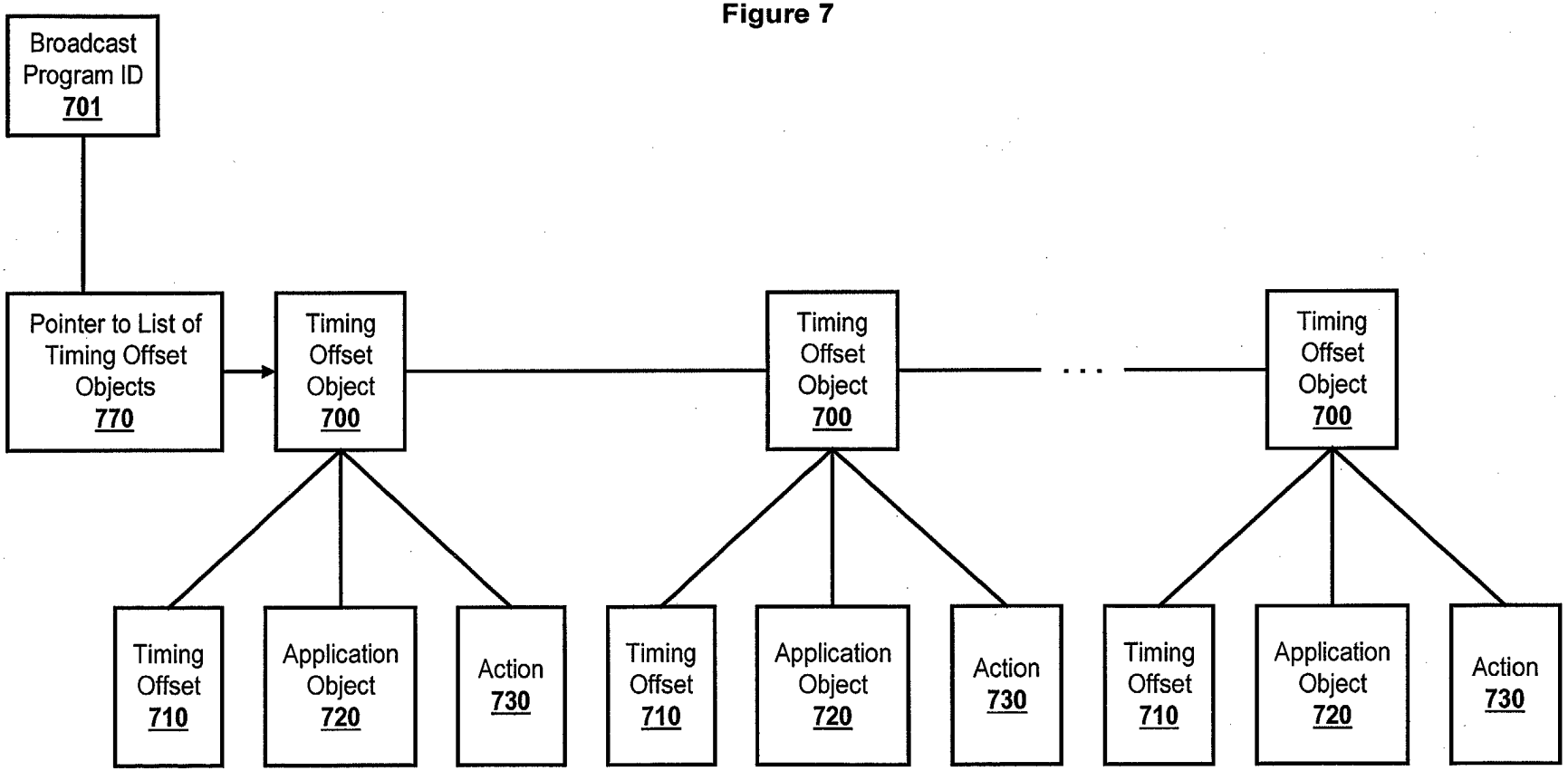
Broadcast Program ID 701
Pointer to List of Timing Offset Objects 770
Timing Offset Object 700
Timing Offset Object 700
Timing Offset Object 700
Timing Offset 710
Application Object 720
Action 730
Timing Offset 710
Application Object 720
Action 730
Timing Offset 710
Application Object 720
Action 730

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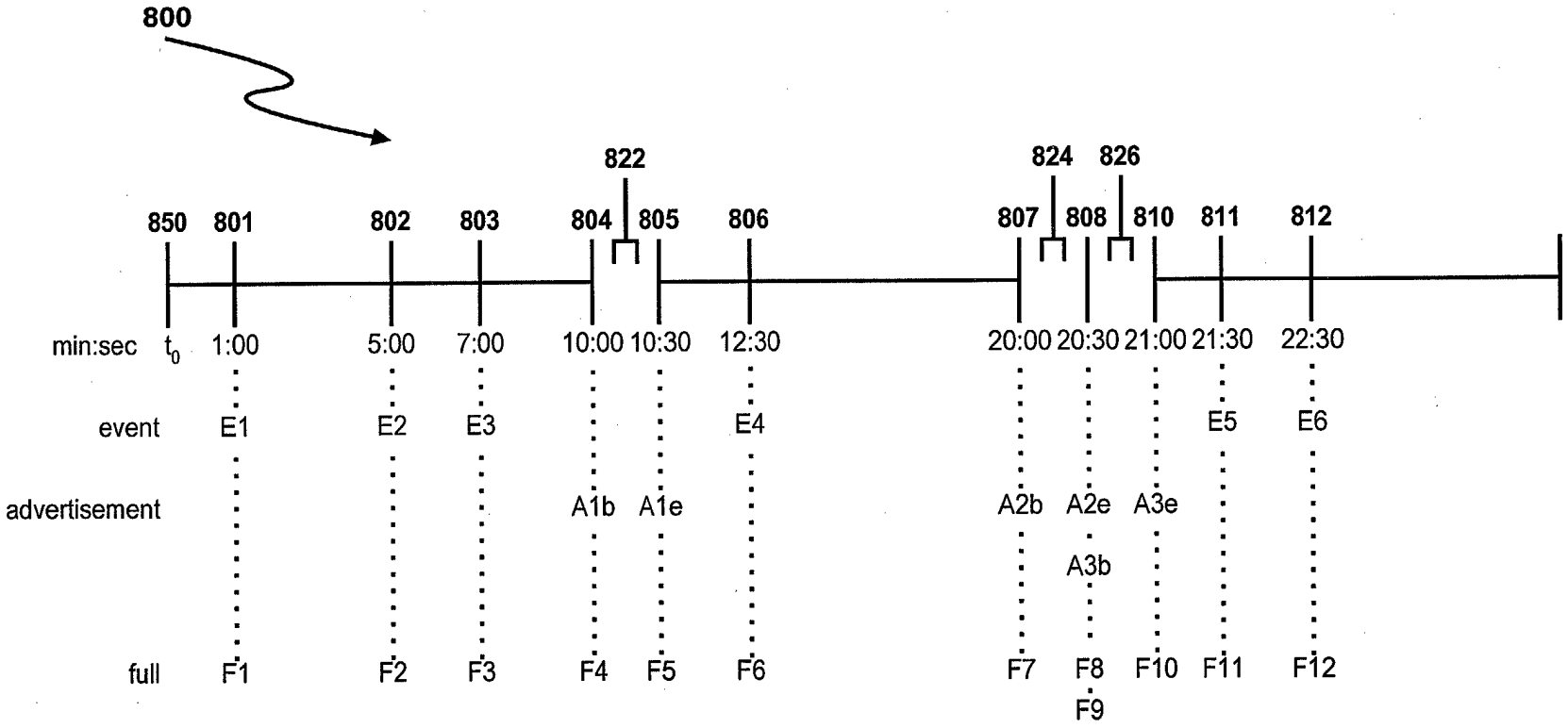
Figure 8



PTO/SB/01 (6–95) (modified)
Approved for use through 10/31/96 OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

0010/PTO
Rev. 6/95

U.S. Department of Commerce
Patent and Trademark Office

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

[X] Declaration Submitted with Initial Filing OR [ ] Declaration Submitted after Initial Filing

Attorney Docket Number	**4562US**
First Named Inventor	**Brian P. Dougherty**
COMPLETE IF KNOWN	
Application Number	***unknown***
Filing Date	***unknown***
Group Art Unit	***unknown***
Examiner Name	***unknown***

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

USING THE ELECTRONIC PROGRAM GUIDE TO SYNCHRONIZE INTERACTIVITY WITH BROADCAST PROGRAMS

the specification of which (*Title of the Invention*)

[X] is attached hereto

OR

[ ] was filed on (MM/DD/YYYY) [_____] as United States Application Number or PCT International Application Number [_____] and was amended on (MM/DD/YYYY) [_____] (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations. § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code § 119 (a)-(d) or § 385(b) of any foreign application(s) for patent or inventor's certificate, or § 365 (a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			[ ]	[ ]	[ ]
			[ ]	[ ]	[ ]
			[ ]	[ ]	[ ]
			[ ]	[ ]	[ ]
			[ ]	[ ]	[ ]

[ ] Additional foreign application numbers are listed on a supplemental priority sheet attached hereto:

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	
60/179,825	**02/02/2000**	[ ] Additional provisional application numbers are listed on a supplemental sheet attached hereto.

DECLARATION	Page 2

I hereby claim the benefit under Title 35, United States Code § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (*if applicable*)

[ ] Additional U.S. or PCT international application numbers are listed on a supplemental priority sheet attached hereto.

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Name	Registration Number	Name	Registration Number
Michael R. Blum	**44,543**	**Dana Rao** **Robert R. Sachs**	**43,875** **42,120**

[ ] Additional attorney(s) and/or agent(s) named on a supplemental sheet attached hereto.

Please direct all correspondence to:

Michael R. Blum
Fenwick & West LLP
Two Palo Alto Square
Palo Alto, CA 94306
U.S.A.

Telephone	**(650) 858-7668**	Fax	**(650) 494-1417**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: [ ] A petition has been filed for this unsigned inventor

Given Name	**Brian**	Middle Initial	**P.**	Family Name	**Dougherty**	Suffix e.g. Jr.	

Inventor's Signature	Brian P. Dougherty	Date	3/20/00

Residence: City	**Lafayette**	State	**CA**	Country	**USA**	Citizenship	**USA**

Mailing Address	**1259 Redwood Road**
Mailing Address	

City	**Lafayette**	State	**CA**	Zip	**94549**	Country	**USA**

[ ] Additional inventors are being named on supplemental sheet(s) attached hereto

DECLARATION	ADDITIONAL INVENTOR(S) Supplemental Sheet

Name of Additional Joint Inventor, if any:	[ ] A petition has been filed for this unsigned inventor						
Given Name	C. Leo	Middle Initial		Family Name	Meier	Suffix e.g. Jr.	
Inventor's Signature	C Leo Meier				Date	3/28/00	
Residence: City	Berkeley	State	CA	Country	USA	Citizenship	USA
Mailing Address	1110 Euclid Avenue						
Mailing Address							
City	Berkeley	State	CA	Zip	94708	Country	USA

Name of Additional Joint Inventor, if any:	[ ] A petition has been filed for this unsigned inventor						
Given Name		Middle Initial		Family Name		Suffix e.g. Jr.	
Inventor's Signature					Date		
Residence: City		State		Country		Citizenship	
Mailing Address							
Mailing Address							
City		State		Zip		Country	

Name of Additional Joint Inventor, if any:	[ ] A petition has been filed for this unsigned inventor						
Given Name		Middle Initial		Family Name		Suffix e.g. Jr.	
Inventor's Signature					Date		
Residence: City		State		Country		Citizenship	
Mailing Address							
Mailing Address							
City		State		Zip		Country	

Name of Additional Joint Inventor, if any:	[ ] A petition has been filed for this unsigned inventor						
Given Name		Middle Initial		Family Name		Suffix e.g. Jr.	
Inventor's Signature					Date		
Residence: City		State		Country		Citizenship	
Mailing Address							
Mailing Address							
City		State		Zip		Country	

[ ] Additional inventors are being named on supplemental sheet(s) attached hereto